

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
29 December 2004 (29.12.2004)

PCT

(10) International Publication Number  
**WO 2004/114422 A1**

(51) International Patent Classification?: **H01L 33/00,**  
21/20

(21) International Application Number:  
PCT/KR2004/001546

(22) International Filing Date: 25 June 2004 (25.06.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
10-2003-0041813 26 June 2003 (26.06.2003) KR

(71) Applicant (for all designated States except US):  
POSTECH FOUNDATION [KR/KR]; San 31, Hy-  
oja-dong, Nam-gu, Pohang-si, Kyungsangbuk-do 790-784  
(KR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **YI, Gyu-Chul**  
[KR/KR]; Kyosu Apt. 9-2202, #756, Jigok-dong, Nam-gu,

Pohang-si, Kyungsangbuk-do 790-390 (KR). **PARK, Won-II** [KR/KR]; Department of Materials Science and Engineering, POSTECH, Hyoja-dong, Nam-gu, Po-  
hang-si, Kyungsangbuk-do 790-784 (KR).

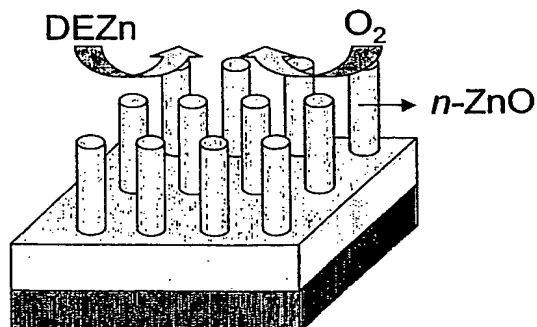
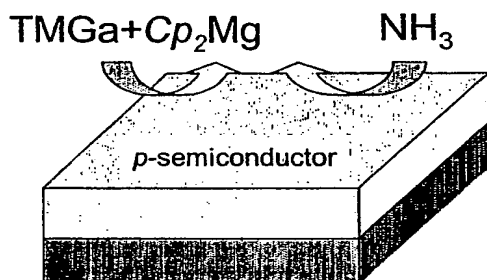
(74) Agents: **JANG, Seongku** et al.; 19th Fl., KEC Building,  
#275-7, Yangjae-dong, Seocho-ku, Seoul 137-130 (KR).

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG,  
MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH,  
PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN,  
TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

[Continued on next page]

(54) Title: P-N HETEROJUNCTION STRUCTURE OF ZINC OXIDE-BASED NANOROD AND SEMICONDUCTOR THIN FILM, PREPARATION THEREOF, AND NANO-DEVICE COMPRISING SAME



(57) Abstract: A heterojunction structure composed of a p-type semiconductor thin film and n-type ZnO-based nanorods epitaxially grown thereon exhibits high luminescence efficiency property due to facilitated tunneling of electrons through the nano-sized junction and the use of ZnO having high exciton energy as a light emitting material, and thus it can be advantageously used in nano-devices such as LED, field effect transistor, photodetector, sensor, etc.



FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,  
SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Published:**

— *with international search report*